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University of Maine.

Maine Agricultural Experiment Station

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FERTILIZER INSPECTION.

38.

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AGRICULTURAL EXPERIMENT STATION
ORONO, MAINE.

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BULLETIN No. 153

FERTILIZER INSPECTION.

Chas. D. Woods, Director.

J. M. Bartlett, Chemist in Charge of Inspection Analyses.

The law regulating the sale of commercial fertilizers in this State calls for two bulletins each year. The first of these contains the analyses of the samples received from the manufacturer, guaranteed to represent, within reasonable limits, the goods to be placed upon the market later. The second bulletin contains the analyses of the samples collected in the open market by a representative of the Station.

In the tables which follow the discussion there are given the results of the analyses of the manufacturers' samples of licensed brands. The tables include all the brands which have been licensed to February 10, 1908. Dealers are cautioned against handling any brands not given in this list without first writing the Station.

The figures which are given as the percentages of valuable ingredients guaranteed by the manufacturers are the minimum percentages of the guarantee. If, for instance, the guarantee is 2 to 3 per cent of nitrogen, it is evident that the dealer cannot be held to have agreed to furnish more than 2 per cent, and so this percentage is taken as actual guarantee. The figures under the head of "found" are those showing the actual composition of the samples.

Fertility and Plant Food.

To produce profitable crops and at the same time to maintain and even to increase the productive capacity of the soil may rightly be termed "good farming" Many farmers are able to do this, and the knowledge of how to do it has been largely acquired through years of experience, during which the character of the soil, its adaptability for crops, and the methods of its management and manuring have been made the subjects of careful study, without, however, any definite and accurate knowledge concerning manures and their functions in relation to soils and crops. Those who desire to study these questions, are invited to write the Dean of the College of Agriculture, University of Maine, Orono, Maine, who will gladly send a list of suitable books and give full information relative to correspondence courses on this subject.

Soils vary greatly in their capabilities of supplying food to crops. Different ingredients are deficient in different soils. The way to learn what materials are proper in a given case is by observation and experiment. The rational method for determining what ingredients of plant-food a soil fails to furnish in abundance, and how these lacking materials can be most economically supplied, is to put the questions to the soil with different fertilizing materials and get the reply in the crops produced. How to make these experiments is explained in Circular No. 8 of the Office of Experiment Stations of the U. S. Department of Agriculture. A copy of this circular can be had by applying to the Secretary of Agriculture, Washington, D. C.

The chief use of fertilizers is to supply plant-food. It is good farming to make the most of the natural resources of the soil and of the manures produced on the farm, and to depend upon artificial fertilizers only to furnish what more is needed. It is not good economy to pay high prices for materials which the soil may itself yield, but it is good economy to supply the lacking ones in the cheapest way. The rule in the purchase of costly commercial fertilizers should be to select those that supply, in the best forms and at the lowest cost, the plant-food which the crop needs and the soil fails to furnish.

Plants differ widely with respect to their capacities for gathering their food from soil and air; hence the proper fertilizer in a given case depends upon the crop as well as upon the soil. The fertility of the soil would remain practically unchanged if all the ingredients removed in the various farm products were restored to the land. This may be accomplished by feeding the crops grown on the farm to animals, carefully saving the manure and returning it to the soil. If it is practicable to pursue a system of stock feeding in which those products of the farm which are comparatively poor in fertilizing constituents are exchanged in the market for feeding stuffs of high fertilizing value, the loss of soil fertility may be reduced to a minimum, or there may be an actual gain in fertility.

Constituents of Fertilizers.*

The only ingredients of plant-food which we ordinarily need to consider in fertilizers are potash, lime, phosphoric acid, and nitrogen. The available supply of lime is often insufficient; hence one reason for the good effect so often observed from the application of lime, and of plaster, which is a compound of lime and sulphuric acid. The remaining substances, nitrogen, phosphoric acid and potash, are the most important ingredients of our common commercial fertilizers, both because of their scarcity in the soil and their high cost. It is in supplying these that phosphates, bone manures, potash-salts, guano, nitrate of soda, and most other commercial fertilizers are chiefly useful.

The term "form" as applied to a fertilizing constituent has reference to its combination or association with other constituents which may be useful, though not necessarily so. The form of the constituent, too, has an important bearing upon its availability, and hence upon its usefulness as plant food. Many materials containing the essential elements are practically worthless as sources of plant-food because the form is not right; the plants are unable to extract them from their combinations; they are "unavailable." In many of these materials the forms may be changed by proper treatment, in which case they become valuable not because the element itself is changed, but because it then exists in such form as readily to feed the plant.

Nitrogen is the most expensive of the three essential fertilizing elements. It exists in three different forms, organic nitrogen, ammonia and nitrate.

Organic nitrogen exists in combination with other elements either as vegetable or animal matter. All materials containing organic nitrogen are valuable in proportion to their rapidity of decay, because change of form must take place before the nitrogen can serve as plant food. Organic nitrogen differs in availability not only according to the kind of material which supplies it, but according to the treatment it receives. The nitrogen in the tables of analyses marked "insoluble in water" is organic nitrogen.

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*Farmers Bulletin 44 of the U. S. Dept. of Agriculture, "Commercial Fertilizers, Composition and Use," can be had free by applying to your Congressman. Bulletin 107, Home Mixed Fertilizers of this Station will be sent on application.

Nitrogen as ammonia usually exists in commercial manures in the form of sulphate of ammonia and is more readily available than organic nitrogen. While nitrogen in the form of ammonia is extremely soluble in water, it is not readily removed from the soil by leaching, as it is held by the organic compounds of the soil.

Nitrogen as nitrate exists in commercial products chiefly as nitrate of soda. Nitrogen in this form is directly and immediately available, no further changes being necessary. It is completely soluble in water, and diffuses readily throughout the soil. It differs from the ammonia compounds in forming no insoluble compounds with soil constituents and may be lost by leaching. The "Nitrogen soluble in water" of the tables includes both the nitrogen as ammonia and as nitrate.

Phosphoric acid is derived from materials called phosphates, in which it may exist in combination with lime, iron, or alumina as phosphates of lime, iron or alumina. Phosphate of lime is the form most largely used as a source of phosphoric acid. Phosphoric acid occurs in fertilizers in three forms: That soluble in water and readily taken up by plants; that insoluble in water, but still readily used by plants, also known as "reverted;" and that soluble only in strong acids and consequently very slowly used by the plant. The "soluble" and "reverted" together constitute the "available" phosphoric acid. The phosphoric acid in natural or untreated phosphates is insoluble in water, and not readily available to plants. If it is combined with organic substances as in animal bone, the rate of decay is more rapid than if with purely mineral substances. The insoluble phosphates may be converted into soluble forms by treatment with strong acids. Such products are known as acid phosphates or superphosphates. The "insoluble phosphoric acid" of a high cost commercial fertilizer has little or no value to the purchaser because at the usual rate of application the quantity is too small to make any perceptible effect upon the crop, and because its presence in the fertilizer excludes an equal amount of more needful and valuable constituents.

Potash in commercial fertilizers exists chiefly as muriates and sulphates. With potash the form does not exert so great an influence upon availability as is the case with nitrogen and phosphoric acid. All ordinary forms are freely soluble in water, and are believed to be nearly if not quite equally available as food. The form of the potash has an important influence upon the quality of certain crops. For example, the results of experiments seem to indicate that the quality of tobacco, and certain other crops, is unfavorably influenced by the use of muriate of potash, while the same crops show a superior quality if materials free from chlorides have been used as the source of potash.

Valuation of Fertilizers.

The agricultural value of any fertilizing constituent is measured by the value of the increase of the crop produced by its use, and is, of course, a variable factor, depending upon the availability of the constituent, and the value of the crop produced. The form of the materials used must be carefully considered in the use of manures. Slow-acting materials cannot be expected to give profitable returns upon quick growing crops, nor expensive materials profitable returns when used for crops of relatively low value.

The agricultural value is distinct from what is termed "commercial value," or cost in market. This last is determined by market and trade conditions, as cost of production of the crude material, methods of manipulation required, etc. Since there is no strict relation between agricultural and commercial or market value, it may happen that an element in its most available form, and under ordinary conditions of high agricultural value, costs less in market than the same element in less available forms and of a lower agricultural value. The commercial value has reference to the material as an article of commerce, hence commercial ratings of various fertilizers have reference to their relative cost and are used largely as a means by which the different materials may be compared.

The commercial valuation of a fertilizer consists in calculating the retail trade-value or cash-cost at freight centers (in raw materials of good quality) of an amount of nitrogen, phosphoric acid and potash equal to that contained in one ton of the fertilizer. Plaster, lime, stable manure and nearly all of the less expensive fertilizers have variable prices, which bear no close relation to their chemical composition, but guanos, superphosphates, and similar articles, for which $20 to $75 per ton are paid, depend for their trade value exclusively on the substances, nitrogen, phosphoric acid and potash, which are comparatively costly and steady in price. The trade-value per pound of these ingredients is reckoned from the current market prices of the standard articles which furnish them to commerce. The consumer, in estimating the reasonable price to pay for high-grade fertilizers, should add to the trade-value of the above-named ingredients a suitable margin for the expenses of manufacturer, etc., and for the convenience or other advantage incidental to their use.

For many years this Station has not printed an estimate of the commercial value of the different brands licensed in the State. If anyone wishes to calculate the commercial value he can do so by using the trade values adopted for 1908 by the Experiment Stations of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, Rhode Island and Vermont. These valuations represent the average retail prices at which these ingredients could be purchased during the three months preceding March 1, 1908, in ton lots at tide water in the states named. On account of the greater distance from the large markets the prices for Maine at tide water would probably be somewhat higher than those quoted.

TRADE VALUES OF FERTILIZING INGREDIENTS FOR 1908.

	Cents per pound
Nitrogen in nitrates	18½
in ammonia salts	17½
Organic nitrogen in dry and fine ground fish, meat and blood, and in mixed fertilizers	20½
in fine bone and tankage	20½
in coarse bone and tankage	15
Phosphoric acid, water-soluble	5
citrate-soluble	4½
in fine ground bone and tankage	4
in coarse bone and tankage	3
in cotton seed meal, castor pomace and ashes	4
in mixed fertilizers, if insoluble in ammonium citrate	2

Potash as high grade sulphate and in forms free from muriate or chlorides	5
as muriate	4¼

RULES FOR CALCULATING VALUATION OF FERTILIZERS.

The commercial valuation will be accurate enough as a means of comparison if the following rule is adopted:

Multiply 4.1 by the percentage of nitrogen.

Multiply 0.9 by the percentage of available phosphoric acid.

Multiply 0.4 by the percentage of insoluble phosphoric acid.

Multiply 1.0 by the percentage of potash.

The sum of these 4 products will be the commercial valuation per ton on the basis taken.

Illustration. The table of analyses shows a certain fertilizer to have the following composition: Nitrogen 2.00 per cent; Available phosphoric acid 8.50 per cent; Insoluble phosphoric acid 3.50 per cent; Potash 3.25 per cent. The valuation in this case will be computed thus:

Nitrogen,	4.1×2.00,	$8 20
Available phosphoric acid,	0.9×8.50,	7 65
Insoluble phosphoric acid,	0.4×3.50,	1 40
Potash,	1.0×3.25,	3 25
		$20 50

Since this rule assumes all the nitrogen to be organic and all the potash to be in the form of the sulphate, it is evident that the valuations thus calculated must not be taken as the only guide in the choice of a fertilizer. In every case the farmer should consider the needs of his soil before he begins to consider the cost. In many instances a little careful experimenting will show him that materials containing either nitrogen, potash, or phosphoric acid alone will serve his purpose as fully as a "complete fertilizer," in which he must pay for all three constituents, whether needed or not.

Descriptive List of Manufacturers' Samples, 1908.

Station number.	Manufacturer, place of business and brand.
	AMERICAN AGRICULTURAL CHEMICAL CO., NEW YORK, N. Y.
1501	A. A. C. Co's Aroostook Complete Manure
1502	A. A. C. Co's Aroostook High Grade
1503	A. A. C. Co's Northern Maine Potato Special
1529	A. A. C. Complete Manure with 10% Potash
1530	A. A. C. Grass and Lawn Top Dressing
1531	A. A. C. High Grade Fertilizer with 10% Potash
1532	Bradley's Alkaline Bone with Potash
1533	Bradley's Complete Manure for Potatoes and Vegetables
1534	Bradley's Complete Manure with 10% Potash
1535	Bradley's Corn Phosphate
1536	Bradley's Eureka Fertilizer
1537	Bradley's Niagara Phosphate
1538	Bradley's Potato Fertilizer
1539	Bradley's Potato Manure
1540	Bradley's XL Superphosphate of Lime
1541	Clark's Cove Bay State Fertilizer
1542	Clark's Cove Bay State Fertilizer G. G.
1543	Clark's Cove Bay State Fertilizer for Seeding Down
1544	Clark's Cove Defiance Complete Manure
1545	Clark's Cove Great Planet Manure A. A.
1546	Clark's Cove King Phillip Alkaline Guano
1547	Clark's Cove Potato Fertilizer
1548	Clark's Cove Potato Manure
1549	Cleveland Fertilizer for all Crops
1550	Cleveland High Grade Complete Manure
1551	Cleveland Potato Phosphate
1552	Cleveland Seeding Down Fertilizer
1553	Cleveland Superphosphate
1504	Crocker's Ammoniated Corn Phosphate
1505	Crocker's Aroostook Potato Special
1506	Crocker's Grass and Oats Fertilizer
1507	Crocker's High Grade
1508	Crocker's New Rival Ammoniated Superphosphate
1509	Crocker's Potato Hop and Tobacco
1510	Crocker's Special Potato Manure
1554	Cumberland Potato Fertilizer
1555	Cumberland Seeding Down Manure
1556	Cumberland Superphosphate
1557	Darling's Blood, Bone and Potash
1558	Fine Ground Bone
1511	Great Eastern General
1512	Great Eastern Grass & Oats Fertilizer
1513	Great Eastern High Grade Potato Manure
1514	Great Eastern Northern Corn Special
1515	Great Eastern Potato Manure

Analysis of Manufacturers' Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	Soluble in water.	Insoluble in water.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Founf.	Guaranteed.
%	%	%	%	%	%	%	%	%	%	%	%	%	%
1501	0.01	1.40	2.41	2.47	3.08	3.20	2.00	6.28	6.00	8.28	......	10.04	10 00
1502	2.88	1.62	4.50	4.12	4.31	2.21	2.83	6.52	7.00	9.35	......	7.60	10.00
1503	2.42	1.98	4.40	3.70	5.31	2.09	1.53	7.40	7.00	8.93	......	9.85	10.00
1529	1.99	1.46	3.45	3.30	4.31	1.95	2.07	6.26	6.00	8.33	7.00	9.55	10.00
1530	4.44	0.08	4.52	3.91	1.03	5 16	0.97	7.69	5.00	8.66	6.00	3.56	2.00
1531	1.50	1.03	2.53	2.40	5.82	1.76	2.63	7.58	6.00	10.21	7.00	10.44	10.00
1532	......	......	......	......	5.34	4.18	3.64	9.52	11.00	13.16	12.00	2.49	2.00
1533	2.57	1.37	3.94	3.30	5.49	2.08	2.72	7.57	8 00	10.29	9.00	6.52	7.00
1534	1.99	1.31	3.30	3.30	3.59	3.19	2.44	6.78	6.00	9.22	7.00	11.20	10.00
1535	0.66	1.42	2.08	2.06	7.05	2.55	2.56	9.60	8.00	11 16	10.00	2.01	1.50
1536	0.11	1.06	1.17	1.03	5.93	2.35	1.55	8.28	8.00	11.16	10.00	2.01	1.50
1537	0.40	0.64	1.04	0.82	5.41	3.15	1.38	8.56	7.00	9.94	8.00	1.49	1.00
1538	1.64	0.62	2.26	2.06	5.85	1.89	2.67	7.74	8.00	10.41	10.00	3.13	3.00
1539	1.29	1.44	2.73	2.50	5.42	0.79	2.48	6.21	6.00	8.69	8.00	4.96	5.00
1540	1.45	1.13	2.58	2.50	6.62	2.54	3.25	9.16	9.00	12.41	11.00	2.34	2 00
1541	1.45	1.07	2.52	2.50	6.67	2.39	3.59	9.06	9.00	12.65	11.00	2.34	2.00
1542	1.58	0.74	2.32	2.06	5.42	2.39	3.32	7.81	8.00	11.13	10.00	1.85	1.50
1543	0.41	0.74	1.45	1.03	5.93	2.80	2.42	8.73	8.00	11.15	10.00	2.57	2.00
1544	0.40	0.68	1.08	0.82	5.24	2.74	1.48	7.98	7.00	9.46	8.00	1.59	1.00
1545	1.88	1.52	3.40	3.30	5.20	3.01	1.96	8.21	8.00	10.17	9 00	7.43	7.00
1546	0.43	0.68	1.11	1.03	5.71	2.67	1.47	8.38	8.00	9.85	10.00	2.12	2.00
1547	1.76	0.56	2.32	2.06	5.92	1.98	2.74	7.90	8.00	10.64	10.00	3.30	3.00
1548	0.56	2.11	2.67	2.50	3.96	3.03	3.49	6.99	6.00	10.48	8.00	5.59	5.00
1549	0.34	0.72	1.06	1.03	5.50	2.87	2.60	8.37	8.00	10.97	10 00	2.30	2.00
1550	2.32	1.33	3.65	3.30	5.63	2.11	2.69	7.74	8.00	10 43	9.00	6.74	7.00
1551	1.63	0.56	2.19	2.06	6.06	1.74	2.73	7.80	8.00	10.53	10 00	3.17	3.00
1552	0.11	1.06	1.17	1.03	5.79	2.89	1.27	8.68	8.00	9.95	10.00	2.20	2.00
1553	0.66	1.40	2.06	2.06	7.17	2.35	2.62	9.52	8.00	12.14	10.00	2.03	1.50
1504	0.26	2.06	2.32	2.06	4.52	3.65	3.87	8.17	8.00	12.04	......	2.26	1.50
1505	0.81	1.29	2.10	2.06	5.17	3.33	2.03	8.50	8.00	10.53	......	6.61	6.00
1506	......	......	......	......	7.54	4.28	1.79	11.82	11.00	13.61	......	2.03	2.00
1507	1.79	1.52	3.31	3.29	5.87	2.41	2.50	8.28	8.00	10.78	......	7.41	7.00
1508	0.23	1.14	1.27	1.03	4.82	3.70	2.47	8.52	8.00	10.90	......	2.12	2.00
1509	1.10	1.10	2.20	2.06	5.98	2.07	2.68	8.05	8.00	10.73	......	3.34	3.00
1510	2.01	1.30	3.31	3.29	3.84	3.29	2.34	7.13	6.00	9.47	......	10.80	10.00
1554	0.72	1.34	2.06	2.06	6.13	4.17	2.33	10.30	8.00	12.63	10.00	3.38	3.00
1555	0.44	0.72	1.16	1.03	5.42	2.98	2.53	8.40	8.00	10 93	10.00	2.53	2.00
1556	1.64	0.74	2.38	2.08	5.30	2.56	3.18	7.86	8.00	11.04	10.00	1.89	1.50
1557	2.76	1.40	4.16	4.10	4.98	1.90	2.48	6.88	7.00	9.36	8.00	7.16	7.00
1558	......	......	2 50	2.47	......	......	......	......	......	25.31	22.80	......	......
1511	0.52	0.96	1.48	0.82	5.17	2.42	3.05	7.59	8.00	10.64	......	4.73	4.00
1512	......	......	......	......	4.11	6.88	4.08	10.99	11.00	15.07	......	2.15	2.00
1513	2.38	1.00	3.38	3 29	4.87	3.25	1.86	8.12	6.00	9.98	......	10.64	10.00
1514	0.42	1.84	2.26	2.06	5.02	4.60	2.35	9.62	8.00	11.98	......	2.26	1.50
1515	0.85	1.23	2.08	2.06	5.92	2.31	2.76	8.23	8.00	10.99	......	3.37	3.00

Descriptive List of Manufacturers' Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1516	Great Eastern Potato Special
1559	High Grade Sulphate of Potash
1517	Lazaretto Aroostook Potato Guano
1518	Lazaretto Corn Guano
1519	Lazaretto High Grade Potato Guano
1520	Lazaretto Propellor Potato Guano
1521	Lazaretto Special Potato Guano
1560	Muriate of Potash
1561	Nitrate of Soda
1562	Otis' Potato Fertilizer
1563	Otis' Superphosphate
1564	Pacific Dissolved Bone and Potash
1565	Pacific Grass & Grain Fertilizer
1566	Pacific High Grade General Fertilizer
1567	Pacific Nobsque Guano
1568	Pacific Potato Special
1522	Packer's Union Animal Corn Fertilizer
1523	Packer's Union Economical Vegetable Guano
1524	Packer's Union Gardners' Complete Manure
1525	Packers' Union High Grade
1526	Packer's Union Potato Manure
1527	Packer's Union Universal Fertilizer
1528	Packer's Union Wheat, Oats and Clover Fertilizer
1569	Plain Superphosphate
1570	Quinnipiac Climax Phosphate for all Crops
1571	Quinnipiac Corn Manure
1572	Quinnipiac Market Garden Manure
1573	Quinnipiac Mohawk Fertilizer
1574	Quinnipiac Potato Manure
1575	Quinnipiac Potato Phosphate
1576	Read's Farmers' Friend
1577	Read's High Grade Farmers' Friend
1578	Read's Potato Manure
1579	Read's Practical Potato Special
1580	Read's Standard Superphosphate
1581	Read's Sure Catch Fertilizer
1582	Read's Vegetable & Vine Fertilizer
1583	Soluble Pacific Guano
1584	Standard A. Brand
1585	Standard Bone & Potash
1586	Standard Complete Manure
1587	Standard Fertilizer
1588	Standard Guano for all Crops
1589	Standard Special for Potatoes
1590	Williams & Clark Americus Ammoniated Bone Superphosphate

Analysis of Manufacturers' Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	Soluble in water.	Insoluble in water.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Founf.	Guaranteed.
%	%	%	%	%	%	%	%	%	%	%	%	%	%
1516	1.68	1.62	3.30	3.29	5.87	2.27	2.56	8.14	8.00	10.70	......	7.57	7.00
1559	......	......	......	......	......	......	......	......	......	......	......	49.80	48.00
1517	0.19	0.78	0.97	0.82	5.69	3.36	2.11	9.05	8.00	11.16	......	4.57	4.00
1518	0.95	1.02	1.97	1.64	4.47	3.20	2.74	7.67	8.00	10.41	......	2.53	2.00
1519	1.21	1.82	3.03	3.29	4.00	1.90	2.27	5.90	6.00	8.17	......	10.60	10.00
1520	0.70	1.30	2.06	2.06	5.69	2.56	2.88	8.25	8.00	11.13	......	6.52	6.00
1521	1.69	1.56	3.25	3.29	5.85	2.27	2.55	8.12	8.00	10.67	......	7.70	7.00
1560	......	......	......	......	......	......	......	......	......	......	......	49.63	50.00
1561	15.12	....	15.12	15.00	......	......	......	......	......	......	......	......	......
1562	1.74	0.58	2.32	2.06	5.74	2.28	2.46	8.02	8.00	10.48	10.00	3.05	3.00
1563	0.68	1.38	2.06	2.06	6.94	2.92	2.43	9.86	8.00	12.29	10.00	2.16	1.50
1564	......	......	......	......	5.98	4.81	1.91	10.70	10.00	12.70	11.00	2.43	2.00
1565	0.42	0.64	1.06	0.82	5.46	3.01	1.43	8.47	7.00	9.90	8.00	2.99	1.00
1566	2.13	1.41	3.54	3.30	5.15	2.92	2.14	8.07	8.00	10.21	9.00	7.18	7.00
1567	0.45	0.80	1.25	1.03	5.53	2.31	2.73	7.81	8.00	10.57	10.00	2.14	2.00
1568	0.76	1.34	2.10	2.06	5.69	4.27	2.70	9.96	8.00	12.66	10.00	3.15	3.00
1522	0.31	2.10	2.41	2.47	5.64	3.22	3.46	8.86	9.00	12.32	......	1.91	2.00
1523	0.26	1.42	1.68	1.25	4.65	2.55	2.15	7.20	6.00	9.35	......	3.59	3.00
1524	1.38	1.16	2.54	2.47	5.58	0.47	2.06	6.05	6.00	8.11	......	10.99	10.00
1525	1.75	1.56	3.31	3.29	5.85	2.41	2.55	8.26	8.00	10.81	......	7.53	7.00
1526	0.96	1.10	2.06	2.06	4.85	3.16	1.85	8.01	8.00	9.86	......	6.54	6.00
1527	0.25	0.96	1.21	0.82	6.05	3.22	1.46	9.27	8.00	10.73	......	5.04	4.00
1528	......	......	......	......	......	......	1.20	10.92	11.00	12.12	......	2.39	2.00
1569	......	......	......	......	10.21	3.91	1.30	14.12	14.00	15.42	15.01	......	......
1570	0.39	1.06	1.45	1.03	5.10	3.54	1.63	8.64	8.00	10.27	10.00	2.91	2.00
1571	0.67	1.38	2.05	2.06	6.69	2.63	2.41	9.32	8.00	11.73	10.00	1.95	1.50
1572	2.19	1.08	3.58	3.30	4.23	4.67	1.47	8.90	8.00	10.37	9.00	7.57	7.00
1573	0.03	0.83	0.86	0.82	2.60	4.87	3.86	7.47	7.00	11.33	8.00	1.58	1.00
1574	1.03	1.50	2.53	2.50	2.55	4.03	3.06	6.58	6.00	9.64	8.00	5.15	5.00
1575	0.74	1.39	2.04	2.06	5.61	4.71	2.36	10.32	8.00	12.68	10.00	3.34	3.00
1576	1.57	0.62	2.19	2.06	5.84	2.08	2.59	7.92	8.00	10.51	10.00	3.11	3.00
1577	2.23	1.48	3.71	3.30	3.96	2.13	2.08	6.09	6.00	8.17	7.00	9.59	10.00
1578	0.42	2.28	2.70	2.40	4.59	1.89	1.25	6.48	6.00	7.73	7.00	10.94	10.00
1579	0.42	0.74	1.16	0.82	1.64	2.56	1.99	4.20	4.00	6.19	5.00	8.03	8.00
1580	0.10	0.94	1.04	0.82	5.87	2.89	2.23	8.76	8.00	10.99	10.00	4.81	4.00
1581	......	......	......	......	5.42	3.90	3.09	9.32	10.00	12.41	11.00	2.59	2.00
1582	0.32	1.80	2.12	2.06	5.94	2.25	1.38	8.29	8.00	9.67	10.00	6.35	6.00
1583	1.58	0.80	2.38	2.06	5.18	2.81	3.01	8.09	8.00	11.10	10.00	1.89	1.50
1584	0.31	0.90	1.21	0.82	3.64	4.10	2.08	7.74	7.00	9.82	8.00	1.56	1.00
1585	......	......	......	......	7.66	2.60	1.96	10.26	10.00	12.22	11.00	2.08	2.00
1586	2.40	0.90	3.30	3.30	7.02	1.99	1.04	8.81	8.00	9.85	9.00	7.56	7.00
1587	1.60	0.78	2.38	2.06	5.14	2.41	3.36	7.55	8.00	10.91	10.00	1.70	1.50
1588	0.37	0.70	1.07	1.03	5.31	3.03	1.44	8.24	8.00	9.74	10.00	2.10	2.00
1589	1.68	0.62	2.30	2.06	5.82	2.22	2.45	8.04	8.00	10.49	10.00	3.17	3.00
1590	1.40	1.35	2.75	2.50	5.52	2.65	3.44	8.17	9.00	11.61	11.00	2.78	2.00

Descriptive List of Manufacturers' Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1591	Williams & Clark Americus Corn Phosphate
1592	Williams & Clark Americus High Grade Special
1593	Williams & Clark Americus Potato Manure
1594	Williams & Clark Royal Bone Supherphosphate for all Crops
	ARMOUR FERTILIZER WORKS, BALTIMORE, MD.
1595	All Soluble
1596	Armour's Complete Potato
1597	Bone, Blood & Potash
1598	Fruit and Root Crop Special
1599	Grain Grower
1600	High Grade Potato
1601	Wheat, Corn & Oats Special
	BOWKER FERTILIZER CO., BOSTON, MASS.
1602	Bowker's Blood Bone & Potash
1603	Bowker's Bone & Potash, Square Brand
1604	Bowker's Complete Manure for Potatoes and Vegetables
1605	Bowker's Corn Phosphate
1606	Bowker's Early Potato Manure
1607	Bowker's Farm and Garden Phosphate
1608	Bowker's Fresh Ground Bone
1609	Bowker's Hill & Drill Phosphate
1610	Bowker's Market Garden Fertilizer
1611	Bowker's Potash Bone
1612	Bowker's Potash or Staple Phosphate
1613	Bowker's Potato & Vegetable Fertilizer
1614	Bowkers' Potato & Vegetable Phosphate
1615	Bowker's Six Percent Potato Fertilizer
1616	Bowker's Superphosphate with Potash
1617	Bowker's Sure Crop Phosphate
1618	Bowker's Ten percent Manure
1619	Monticello Grange Chemicals
1620	Special Potato Manure for the Grange
1621	Stockbridge's Manure A for Potatoes
1622	Stockbridge's Special Complete Manure for Corn and all Grain Crops
1623	Stockbridge's Complete Manure for Potatoes & Vegetables
1624	Stockbridge's Special Complete Manure for Quick Growth and Forcing
1625	Stockbridge's Special Complete Manure for Seeding Down, Permanent Dressing and Legumes
	COE-MORTIMER CO., NEW YORK.
1626	E. Frank Coe's Celebrated Special Potato Fertilizer
1627	E. Frank Coe's Columbian Corn Fertilizer
1628	E. Frank Coe's Columbian Potato Fertilizer
1629	E. Frank Coe's Double Strength Potato Manure
1630	E. Frank Coe's Excelsior Potato Fertilizer
1631	E. Frank Coe's Famous Prize Brand Grass & Grain Fertilizer
1632	E. Frank Coe's High Grade Ammoniated Bone Superphosphate
1633	E. Frank Coe's High Grade Potato Fertilizer
1634	E. Frank Coe's New Englander Corn & Potato Fertilizer

Analysis of Manufacturers' Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	Soluble in water.	Insoluble in water.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Founff.	Guaranteed.
%	%	%	%	%	%	%	%	%	%	%	%	%	%
1591	1.35	0.76	2.11	2 06	5.58	2.78	3.04	8.36	8 00	11.40	10.00	1.99	1.50
1592	2.36	1.33	3.69	3.30	5.57	2.56	2.48	8.13	8 00	10.61	9.00	6.54	7.00
1593	1.68	0.60	2.28	2.06	6.17	2.02	2.48	8.19	8.00	10.67	10 00	3.28	3.00
1594	0.29	0.82	1.11	1.03	5.47	3.14	2.55	8.61	8.00	11.16	10.00	2.59	2.00
1595	1.93	1.64	3.57	2.88	7.70	1.19	0.54	8.89	8.00	9.43	10.00	4.40	4.00
1596	1.56	2.06	3.62	3.28	5.85	1.67	0.57	7 52	6.00	8.09	8.00	10.94	10.00
1597	2.34	2.21	4.55	4.11	6.67	1.47	1.01	8.24	8.00	9.25	10.00	8.40	7.00
1598	0.75	1.06	1.81	1.65	7.78	0.35	0.47	8.13	8.00	9.60	10.00	5.93	5.00
1599	0.94	0.72	1.60	1.65	5.61	2.35	1.26	7.96	8.00	9.22	10.00	2.51	2.00
1600	0.94	0.96	1.90	1.65	8.05	1.08	0.50	9.13	8.00	9.63	10.00	10.70	10.00
1601	0.22	0.60	0.82	0.82	5.04	2.24	2.02	7.28	7.00	9.30	9.00	1.24	1.00
1602	2.59	2.02	4.61	4.10	6.28	1.47	1.37	7.75	7.00	9.12	9.00	6.67	7.00
1603	1.03	0.81	1.84	1.65	1.04	3.68	7.10	4.72	6.00	11.82	7.00	2.34	2.00
1604	1.59	1.64	3.23	3.29	4.66	1.58	2.58	6.24	6.00	8.82	7.00	10.51	10.00
1605	0.40	1 14	1.54	1.65	2.27	5.90	2.19	8.17	8.00	10.36	9.00	2.52	2.00
1606	2.32	0.94	3.26	3.29	6.78	1.40	1.02	8.18	8.00	9.20	9.00	7.60	7.00
1607	0.52	1.16	1.68	1.65	2.20	6.62	2.50	8.92	8.00	11.42	9.00	2.80	2.00
1608	......	......	2.53	2.47	......	......	......	......	......	21.42	22.80	......	......
1609	0.71	1.73	2.44	2.47	3.27	5.48	2.76	8.75	9.00	11.51	10.00	2.16	2.00
1610	1.59	0.79	2.38	2.47	5.55	2.12	1.34	7.67	6.00	9.01	7.00	9.85	10.00
1611	0.90	......	0.90	0.82	3.05	1.93	3.03	4.98	6.00	8.01	8.00	2.10	2.00
1612	0.18	0.74	0.92	0.82	1.69	6.43	2.15	8.12	8.00	10.27	9.00	3.37	3.00
1613	0.61	1.73	2.34	2.47	7.26	2.32	0.83	9.58	8.00	10.41	10.00	4.20	4.00
1614	0.30	1.18	1.48	1.65	2.28	6.79	2.31	9.07	8.00	11.38	9.00	2.32	2.00
1615	0.35	0.65	1.00	0.82	1.39	4.82	3.05	6.21	6.00	9.26	7.00	6.48	6.00
1616	......	......	......	......	4.39	5.30	1.71	9.69	10.00	11.40	11.00	2.84	2.00
1617	0.35	0.72	1.07	0.82	4.93	3.50	2.42	8.43	8.00	10.88	9.00	2.37	2.00
1618	0.17	0.69	0.86	0.82	1.29	3.92	1.99	5.21	5.00	7.20	6.00	10.34	10.00
1619	1.15	1.09	2.24	2.50	5.34	2.80	1.67	8.14	8.00	9.81	12.00	4.17	4.00
1620	1.21	0.90	2.11	1.65	5.76	6.30	2.74	12.06	9.00	14.80	12.00	9.75	12.00
1621	1.60	2.64	4.24	4.11	4.31	2.77	1.93	7.08	7.00	9.01	8.00	11.11	10.00
1622	1.93	1.40	3.30	3.29	7.89	2.30	0.91	10.19	10.00	11.10	11.00	7.39	7.00
1623	1.32	1.88	3.20	3.29	2.57	3.54	2.27	6.11	6.00	8.38	7.00	10.34	10.00
1624	3.18	1.88	5.06	4.93	3.01	2.69	2.26	5.70	4.00	7.96	6.00	6.11	6.00
1625	0.79	1.59	2.38	2.47	2.97	2.88	4.24	5.85	6.00	10.00	9.00	10.04	10.00
1626	1.26	0.62	1.88	1.65	7.34	1.19	2.71	8.53	8.00	11.24	10.00	4.73	4.00
1627	0.60	0.74	1.34	1.23	7.29	2.77	2.53	9.46	8.50	12.01	10.50	2.98	2.50
1628	0.54	0.80	1.34	1.23	6.30	2.16	2.49	9.46	8.50	11.95	10.50	3.08	2.50
1629	2.62	1.14	3.76	3.70	4.88	2.37	2.40	7.25	7.00	9.65	8.50	11.75	10.00
1630	1.46	0.96	2.41	2.47	6.03	1.97	2.22	8.00	7.00	10.22	9.00	9.35	8.00
1631	......	......	......	......	6.64	3.96	3.06	10.55	10.50	13.61	12.00	2.59	2.00
1632	1.02	1.06	2.08	1.85	6.76	2.26	2.30	9.02	9.00	11.32	11.00	3.09	2.25
1633	1.68	0.92	2.60	2.40	7.15	1.53	2.76	8.68	8.00	11.44	10.00	6.48	6.00
1634	0.63	0.70	1.33	0.80	7.15	2.42	2.60	9.57	7.50	12.17	9.00	3.11	3.00

Descriptive List of Manufacturers' Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1635	E. Frank Coe's Red Brand Excelsior Guano
1636	E. Frank Coe's Special Grass & Grain Fertilizer
	ESSEX FERTILIZER CO., BOSTON, MASS.
1637	Essex Complete Manure for Potatoes, Roots and Vegetables
1638	Essex Market Garden & Potato Manure
1639	Essex Potato Grower
1640	Essex Special Potato Phosphate
1641	Essex XXX Fish & Potash
	HUBBARD FERTILIZER CO., BALTIMORE, MD.
1642	Hubbard's Blood, Bone & Potash
1643	Hubbard's Farmers' IXL Superphosphate
1644	Hubbard's Five Percent Royal Seal Compound
1645	Hubbard's Royal Ensign
1646	Hubbard's Special Potato Compound
	LISTER'S AGRICULTURAL CHEMICAL WORKS, NEWARK, N. J.
1647	Lister's Animal Bone & Potash
1648	Lister's High Grade Special
1649	Lister's Oneida Special
1650	Lister's Potato Manure
1651	Lister's Special Corn Fertilizer
1652	Lister's Special Potato Fertilizer
1653	Lister's Success
	NATIONAL FERTILIZER CO., BOSTON, MASS.
1654	Chittenden's Complete Root Fertilizer
1655	Chittenden's Eureka Potato Fertilizer
1656	Chittenden's Excelsior Potato Fertilizer
1657	Chittenden's Market Garden Fertilizer
	NEW ENGLAND FERTILIZER CO., BOSTON, MASS.
1659	New England Complete Manure
1660	New England Corn & Grain Fertilizer
1661	New England Corn Phosphate
1662	New England High Grade Potato Fertilizer
1663	New England High Grade Special
1664	New England Market Garden Manure
1665	New England Potato Fertilizer
1666	New England Potato Grower
1667	New England Superphosphate
	PARMENTER & POLSEY FERTILIZER CO., BOSTON, MASS.
1668	A. A. Brand
1669	Aroostook Special
1670	Maine Potato Fertilizer
1671	Plymouth Rock Brand
1672	Special Potato Fertilizer
	PORTLAND RENDERING CO., PORTLAND, MAINE.
1673	Bone Dust Tankage
	R. T. PRENTISS, FERTILIZER CO., HOULTON, MAINE
1674	Prentiss Aroostook Complete
	PROVINCIAL CHEMICAL FERTILIZER CO., ST. JOHN, N. B.
1675	10% Complete Aroostook Potato
	SAGADAHOC FERTILIZER CO., BOWDOINHAM, MAINE.
1676	Acid Phosphate
1677	Aroostook Potato Manure
1678	Dirigo Fertilizer

Analysis of Manufacturers' Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
	Soluble in water.	Insoluble in water.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Founff.	Guaranteed.
%	%	%	%	%	%	%	%	%	%	%	%	%	%
1635	2.30	1.07	3.37	3.30	7.59	2.14	1.77	9.73	9.00	11.50	10.00	6.74	6.00
1636	0.07	0.73	0.80	0.80	6.73	2.57	2.81	9.30	8.50	12.11	10.00	2.28	1.50
1637	1.98	1.38	3.36	3.25	4.31	2.70	1.20	7.01	6.00	8.21	7.00	10.06	10.00
1638	0.38	1.80	2.18	2.00	4.47	3.63	5.22	8.10	8.00	13.22	9.00	5.71	5.00
1639	1.66	1.10	2.76	2.46	4.86	1.78	1.02	6.64	6.00	7.66	7.00	10.57	10.00
1640	1.18	1.40	2.58	2.46	4.86	3.95	1.91	8.81	8.00	10.72	9.00	6.53	6.00
1641	0.40	2.22	2.62	2.00	6.54	2.44	1.91	8.98	8.00	10.89	9.00	3.95	3.00
1642	2.02	1.10	3.12	3.33	6.62	2.14	1.21	8.76	8.00	9.97	9.00	7.20	7.00
1643	1.06	0.90	1.96	1.65	7.35	1.43	0.96	8.78	8.00	9.74	9.00	2.53	2.00
1644	2.70	1.66	4.36	4.20	4.31	2.48	1.34	6.79	6.00	8.13	7.00	6.42	5.00
1645	1.58	1.36	2.94	2.47	8.80	1.08	0.55	9.88	8.00	10.43	9.00	4.55	4.00
1646	2.01	1.30	3.31	3.33	3.96	3.01	1.40	6.97	6.00	8.37	7.00	10.14	10.00
1647	......	......	......	......	3.30	6.81	4.12	10.11	10.00	14.23	11.00	2.17	2.00
1648	0.45	1.50	1.95	1.65	3.75	4.34	3.07	8.09	8.00	11.16	10.00	11.16	10.00
1649	0.34	0.83	1.17	0.83	4.42	3.71	2.48	8.13	7.00	10.61	8.00	1.16	1.00
1650	1.92	1.25	3.17	3.30	5.50	2.46	3.09	7.96	8.00	11.05	9.00	7.22	7.00
1651	0.70	1.12	1.82	1.65	5.63	3.72	2.39	9.35	8.00	11.74	9.00	3.66	3.00
1652	0.64	1.22	1.86	1.65	5.66	3.94	2.19	9.60	8.00	11.79	9.00	3.52	3.00
1653	0.31	0.99	1.30	1.24	6.16	3.02	2.58	9.18	9.00	11.76	11.00	2.37	2.00
1654	1.71	1.73	3.44	3.30	6.51	1.49	1.78	8.00	8.00	9.78	10.00	6.01	6.00
1655	0.85	1.78	2.63	2.40	4.19	1.46	1.75	5.65	6.00	7.40	8.00	10.48	10.00
1656	1.80	1.76	3.56	3.30	4.08	1.88	1.85	5.96	6.00	7.81	8.00	10.56	10.00
1657	1.16	1.26	2.42	2.40	3.70	2.49	2.17	6.19	6.00	8.36	8.00	5.63	5.00
1659	1.91	1.48	3.39	3.28	3.45	3.14	3.57	6.59	6.00	10.16	7.00	10.04	10.00
1660	0.44	0.76	1.20	1.23	5.66	1.40	0.55	7.06	7.00	7.61	8.00	2.05	2.00
1661	0.76	1.02	1.78	1.64	3.85	4.93	1.33	8.78	8.00	10.11	9.00	3.23	3.00
1662	1.28	1.20	2.48	2.46	5.65	2.38	2.16	8.03	8.00	10.19	9.00	6.18	6.00
1663	2.32	1.40	3.72	3.69	5.38	3.53	1.17	8.91	7.00	9.08	8.00	10.54	10.00
1664	2.07	2.22	4.29	4.10	5.95	1.16	1.91	7.11	7.00	9.02	8.00	7.91	7.00
1665	0.88	0.88	1.76	1.64	3.46	4.89	0.98	8.35	7.00	9.33	8.00	4.28	4.00
1666	1.38	1.16	2.54	2.46	3.45	2.59	2.40	6.04	6.00	8.44	7.00	10.33	10.00
1667	0.88	1.60	2.48	2.46	5.66	1.93	3.77	7.59	8.00	11.36	10.00	4.34	4.00
1668	2.11	2.44	4.55	4.10	5.93	1.86	1.67	7.79	7.00	9.46	8.00	7.64	8.00
1669	2.70	1.26	3.96	3.69	5.33	1.95	2.64	7.28	7.00	9.92	8.00	10.18	10.00
1670	2.38	1.26	3.64	3.29	5.10	0.90	1.85	6.09	6.00	7.94	7.00	10.90	10.00
1671	0.96	1.62	2.58	2.47	4.86	2.75	3.67	7.61	8.00	11.28	9.00	4.11	4.00
1672	2.00	1.36	3.36	3.29	6.09	1.04	1.53	7.13	8.00	8.66	9.00	7.06	7.00
1673	......	......	5.83	5.75	......	......	......	......	......	16.91	14.50	......	.....
1674	2.74	1.16	3.32	3.28	2.23	3.67	1.72	5.90	6.00	7.62	7.00	10.66	10.00
1675	3.39	0.76	4.15	3.29	6.83	1.11	0.87	8.00	8.00	8.87	8.87	11.15	10.00
1676	......	......	......	......	13.48	2.52	0.83	16.00	14.00	16.33	14.00	......	......
1677	0.92	0.08	1.00	1.05	7.11	1.44	0.45	8.55	6.00	9.00	7.00	4.97	4.00
1678	1.02	1.78	2.80	1.00	3.19	2.01	1.34	5.20	4.00	6.54	6.00	4.75	2.00

Descriptive List of Manufacturers' Samples, 1908.

Station number.	Manufacturer, place of business and brand.
1679	Muriate of Potash
1680	Nitrate of Soda
1681	Sagahahoc High Grade Superphosphate
1682	Sagadahoc Special Potato Fertilizer
1683	XX Chemical Fertilizer
1684	Yankee Fertilizer
1685	3-6 and 10 Fertilizer
1686	4-6 and 10 Fertilizer
	SWIFT'S LOWELL FERTILIZER CO., BOSTON, MASS.
1687	Acid Phosphate
1688	Muriate of Potash
1689	Nitrate of Soda
1690	Swift's Lowell Animal Brand
1691	Swift's Lowell Bone Fertilizer
1692	Swift's Lowell Cereal Fertilizer
1693	Swift's Lowell Dissolved Bone and Potash
1694	Swift's Lowell Empress Brand
1695	Swift's Lowell Potato Manure
1696	Swift's Lowell Potato Phosphate
1697	Swift's Lowell Potato Grower
1698	Swift's Lowell Potato Fertilizer
1699	Swift's Lowell Special Vegetable
1700	Swift's Lowell Superior Fertilizer
	TUSCARORA FERTILIZER CO., BALTIMORE, MD.
1701	Tuscarora Aroostook Special
1702	Tuscarora Complete Potato
1703	Tuscarora Fruit and Potato
1704	Tuscarora Trucker
	WHITMAN & PRATT RENDERING CO., LOWELL, MASS.
1711	Whitman & Pratt's Corn Success
1712	Whitman & Pratt's Potash Special
1713	Whitman & Pratt's Potato Manure
1714	Whitman & Pratt's Vegetable Grower
	THE WILCOX FERTILIZER CO., MYSTIC, CONN.
1709	Wilcox Premium Potato Fertilizer
1710	Wilcox Complete Bone Superphosphate

Analysis of Manufacturers' Samples, 1908.

Station number.	Nitrogen.				Phosphoric Acid.							Potash.	
	Soluble in water.	Insoluble in water.	Total.		Soluble.	Reverted.	Insoluble.	Available.		Total.		Found.	Guaranteed.
			Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.		
%	%	%	%	%	%	%	%	%	%	%	%	%	%
1679	......	......	......	......	......	......	......	......	......	......	......	53.20	50.00
1680	15.58	......	15.58	15.00	......	......	......	......	......	......	......	......	......
1681	1.54	0.38	1.92	1.85	6.86	1.14	3.50	8.00	7.00	11.50	8.00	4.37	3.00
1682	1.33	0.58	1.91	2.00	4.63	1.66	4.54	6.29	7.00	10.83	8.00	9.83	8.00
1683	7.03	1.07	8.10	7.00	......	......	3.76	4.29	3.00	8.05	7.00	10.05	8.00
1684	0.35	0.41	0.76	0.40	7.30	2.73	1.04	10.03	7.00	11.07	8.00	3.05	2.00
1685	1.73	0 80	2.53	3.25	3.11	1.56	1.98	4.67	5.00	6.65	7.00	10.18	10.00
1686	2.65	0.80	3.45	2.35	3.19	3.75	1.70	6.94	5.00	8.64	7.00	10.57	10.00
1687	......	......	......	......	10.05	2.76	2.42	12.81	12.00	15.23	13.00	......	......
1688	......	......	......	......	......	......	......	......	......	......	......	51.80	50
1689	......	......	15.72	15.00	......	......	......	......	......	......	......	......	......
1690	1.04	1.54	2.58	2.46	4.60	4.69	3 97	9.35	8.00	13.32	10.00	4.19	4 00
1691	0.73	0.94	1.67	1.64	5.26	2.76	1 79	8.02	8.00	9.81	9.00	3.20	3.00
1692	0 34	0.50	0.84	0.82	5.22	1.76	1.32	6.98	7.00	8.30	8.00	1.18	1.00
1693	0.72	1.04	1.76	1.64	8.21	1.80	1.15	10.01	9.00	11.16	10.00	2 35	2.00
1694	0.87	0.54	1.41	1.23	4.85	2.50	2.32	7.35	7.00	9.67	8.00	2.15	2.00
1695	0.69	0.94	1.63	1.64	4.55	2.10	2.17	6.65	7.00	8.82	8.00	4 07	4.00
1696	1.31	1.16	2.47	2.42	5.66	2.49	1.71	8.15	8.00	9.86	9.00	6.35	6.00
1697	2.14	1.42	3.56	3.28	4.99	1.51	1.35	6.50	6.00	7.85	7.00	10.53	10.00
1698	1.71	0.88	2.59	2.46	5.34	1.77	1.02	7.11	6.00	8.13	7.00	10.51	10 00
1699	1.88	1.48	3.36	3.28	5.95	1.38	1.68	7.33	8.00	9.01	9.00	7.10	7.00
1700	2.52	1.28	3.80	3.69	5.60	1.98	1 30	7.58	7.00	8.88	8.00	10.23	10.00
1701	1.45	1.16	2.61	2.47	6.94	1.18	0.89	8.12	7.00	9 01	8.00	9 23	8.00
1702	1.66	1.96	3.62	3 29	5 73	1.04	1.06	6.77	6.00	7.83	7 00	10.78	10.00
1703	0.74	1.02	1.76	1 65	7.89	0.98	1.08	8.87	8.00	9.95	9.00	11.40	10.00
1704	2.64	2.12	4.76	4.12	7.93	0.93	0.63	8.86	8 00	9.49	9.00	7.35	7.00
1711	.90	0.87	1.77	1.64	4.61	3.26	2.54	7.87	8.00	10.41	10.00	3.30	3.00
1712	1.47	1.26	2.73	2.88	3.32	3.02	2.89	6.34	6.00	9.23	8.00	10.85	10.00
1713	1.34	1.01	2.35	2.45	2.44	4.81	1.28	1.25	7.00	8.53	9.00	5.41	5.00
1714	......	......	......	3.29	......	......	......	......	8.00	......	......	......	7.00
1709	1.76	1.98	3.74	3.70	4.86	2.88	1.91	7.74	7.00	9.65	8.00	10.36	10.00
1710	1.14	1.26	2.40	2 05	1.83	6.23	5.42	8.06	8.00	13.48	9.00	4.00	3.00

PRENTISS AROOSTOOK COMPLETE FERTILIZER.

While the spring fertilizer bulletin is primarily intended to discuss brands to be offered during the year, there has so much developed since the publication of the fall bulletin from the standpoint of the makers, the handlers and the users of one brand of fertilizer sold in 1907 that it seems imperative to depart from the usual custom and state at considerable length the situation regarding these goods.

In 1906 the R. T. Prentiss Company began to sell fertilizers in Maine. That year they licensed two brands bearing their own name, and one brand of the Tuscarora Fertilizer Company. In planning for their business in 1907, they arranged to sell most of their fertilizers on contract, taking their pay in the potatoes grown during the season at a stated price buying their good for this year from the Buffalo Fertilizer Company of Buffalo, N. Y.

In the spring of 1907 the R. T. Prentiss Company licensed two brands of fertilizers,—The Prentiss Aroostook Complete and the Prentiss Aroostook Standard. Apparently but little of the second brand was sold. The Prentiss Aroostook Complete was guaranteed to carry 3.29 per cent nitrogen, 6 per cent available phosphoric acid, 8 per cent total phosphoric acid and 10 per cent potash. The manufacturer's sample was up to the guaranty in the valuable constituents, carrying 3.53 per cent nitrogen; 6.34 per cent available phosphoric acid and 12.89 per cent of potash. The inspector drew two samples at the warehouse in the spring of 1907,—one in Houlton and one in Fort Fairfield. These samples both ran under guaranty, carrying respectively 2.36 and 2.42 per cent nitrogen; 4.48 and 5.52 per cent available phosphoric acid; and 8.18 and 9.48 per cent potash. When the analyses were completed, the results were reported to the Buffalo Fertilizer Company, and to the R. T. Prentiss Company. As a result of the analyses, Mr. Prentiss and the New England manager of the Buffalo Fertilizer Company called at the Experiment Station office, expressed surprise at the low analysis, and asked that other samples be taken and said that some of their 1907 goods were still in stock at Houlton and Presque Isle. Two other samples were taken. These differ greatly in composition and analyze respectively as folows:—Nitrogen 2.24 and 3.14 per cent; available phosphoric acid 5.66 and 5.50 per cent; potash 6.99 and 10.48 per cent. The fall bulletin was printed prior to the making of these analyses and they were not included therein.

Analysis of Prentiss 4-6-10 Samples, 1907.

	Nitrogen.				Phosphoric Acid.							Potash.	
			Total.					Available.		Total.			
Station number.	Soluble in water.	Insoluble in water.	Found.	Guaranteed.	Soluble.	Reverted.	Insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.
	%	%	%	%	%	%	%	%	%	%	%	%	%
1290	2.22	0.14	2.36	3.29	1.63	2.85	1.93	4.48	6.00	6.41	8.00	8.18	10.00
1306	1.80	0.62	2.42	......	1.67	3.85	1.73	5.52	......	7.25	......	9.48	......
1341	1.94	0.30	2.24	......	1.91	3.75	1.75	5.66	......	7.41	......	6.99	......
1342	2.18	0.96	3.14	......	2.11	3.39	1.15	5.50	......	6.65	......	10.48	......
1343	2.20	0.72	2.92	......	2.74	3.20	0.88	5.94	......	6.82	......	9.36	......
1344	1.86	0.60	2.46	......	1.75	3.07	1.56	4.82	......	6.38	......	9.24	......
1345	1.49	0.95	2.44	......	3.68	2.57	1.34	6.25	......	7.59	......	10.42	......
1347	2.82	0.74	3.56	......	3.35	2.30	1.30	5.65	......	6.95	......	9.57	......
1348	2.12	0.80	2.92	......	2.74	3.27	1.15	6.01	......	7.16	......	9.43	......
1349	2.13	0.82	2.95	......	2.22	3.21	1.44	5.43	......	6.87	......	10.03	......
1350	2.09	0.92	3.01	......	3.65	2.29	1.52	5.94	......	7.46	......	9.67	......
1351	2.39	0.82	3.21	......	1.90	4.03	0.92	5.93	......	6.85	......	10.06	......
1352	2.28	0.94	3.22	......	3.22	2.88	0.99	6.10	......	7.09	......	10.00	......
Avg.	......	......	2.83	......	......	......	......	5.63	......	7.57	......	9.45	......
"	below	guar.	0.46	......	......	......	......	0.37	......	0.43	.....	0.55	......

A sample was also sent to the Station by a farmer at Easton. This sample analyzed,—Nitrogen 2.92 per cent; available phosphoric acid 5.94 per cent; potash 9.36 per cent. Later this gentleman visited the Experiment Station and expressed his opinion relative to the quality of the Prentiss' 4-6-10 goods and stated that there were considerable of these goods still unused in his part of the county. As a result the Station chemist, who had drawn the official fertilizer samples, visited Easton and Presque Isle, putting himself is touch with the farmers at Easton who had used the goods, and drew samples wherever any unopened goods were still in stock, provided they had apparently been well stored. Also some farmers were visited in Presque Isle in company with one of the managers of the R. T. Prentiss Company. As a result 13 samples of the R. T. Prentiss Company's 4-6-10 goods, Prentiss Aroostook Complete Fertilizer, were analyzed with results given in the table on page 103. Sample 1290 was drawn at Houlton and 1306 at Fort Fairfield in the spring of 1907. Sample 1341 was taken at Houlton and 1342 at Presque Isle in October. Sample 1343 was sent to the Experiment Station from Easton. Samples 1344, 1345, 1347, 1348 and 1349 were drawn at Easton by a Station chemist in November, 1907. Samples 1350, 1351, and 1352 were drawn at Presque Isle.

It will be noted that on the average the 13 analyses show a shortage of .46 per cent nitrogen, .37 available phosphoric acid, .43 per cent total phosphoric acid, and .55 per cent potash.

The valuations placed upon fertilizing constituents by the directors of the New England States and New Jersey for 1907 are given in Bulletin 140 of this Station*. The valuation of the Prentiss fertilizer from the guaranteed analysis, following the rule for calculating given on page 71 of that bulletin, is as follows:

Total nitrogen, 3.29 per cent	$13 49
Available phosphoric acid, 6 per cent	5 40
Insoluble phosphoric acid, 2 per cent	80
Potash, 10 per cent	10 00
Valuation	$29 69

The valuation of the goods as shown by analysis,—average of the 13 samples, is as follows:

Total nitrogen, 2.83 per cent	$11 60
Available phosphoric acid, 5.63 per cent	5 07
Insoluble phosphoric acid, 1.94 per cent	78
Potash, 9.45 per cent	9 45
Valuation	$26 90

Difference in valuation, $2.70 or 9.1 per cent.

The goods were tested for the quality of the constituents. Available phosphoric acid may be fairly assumed to be of equal agricultural value irrespective of its source; the potash was apparently present in good form; the availability of the nitrogen by laboratory tests compared favorably with other equally high grade brands offered in Aroostook county in 1907. The nitrogen was practically all in the form of tankage of good grade and sulphate of ammonia. While in the opinion of the writer, it is desirable that a potato fertilizer for Maine and particularly Aroostook county carry nitrate nitrogen, there is nothing in the fertilizer law or the guaranty given by the R. T. Prentiss Company respecting the form of the nitrogen. The nitrogen which was used is practically as high priced a form as nitrate nitrogen.

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* The valuations for 1908 are the same as in 1907 and are given on page 90 of this bulletin.

As is well known, the season of 1907 was unfavorable for the growth of potatoes in Aroostook county; the late wet spring, the wet summer, the conditions favoring blight, and the early freezing all tended to make it difficult to obtain a satisfactory crop of potatoes. There seems to be quite a widespread dissatisfaction among the users of the R. T. Prentiss Company's goods, and the Station has received frequent letters asking if this can be due to the quality of the fertilizer. It is evident that the R. T. Prentiss Company's Aroostook Complete Potato Fertilizer was about 9 per cent short in its constituents, but a fertilizer carrying in good form 2.83 per cent nitrogen, 5.63 per cent available phosphoric acid and 9.45 per cent potash is still a high grade concentrated fertilizer. Applied as liberally as it was in most cases, it is doubtful if in a field experiment a difference between a fertilizer of this composition and one with the guaranteed analysis would show decisive results. Twelve hundred pounds to the acre of a fertilizer as shown by the analysis would carry 34 pounds of nitrogen; 68 pounds available phosphoric acid and 113 pounds of potash. A crop of 300 bushels of potatoes removes in the tubers about 55 pounds of nitrogen; 25 pounds of phosphoric acid and 85 pounds of potash. On sixteen hundred pounds of a fertilizer carrying 3 per cent nitrogen, 6 per cent available phosphoric acid and 5 per cent of potash, the Station grew in Houlton in 1907 on a measured acre of land, 167½ barrels (460 bushels) of merchantable potatoes. This fertilizer furnished 48 pounds of nitrogen, 96 pounds available phosphoric acid and 100 pounds of potash. Sixteen hundred pounds of Prentiss Aroostook Complete, on the average as analyzed would furnish 45 pounds of nitrogen, 90 pounds of available phosphoric acid and 151 pounds of potash.

All of these fertilizers carry less nitrogen than a large crop would remove, but in practice one should depend somewhat upon the nitrogen of the soil and particularly that of the roots and stubble which are plowed under. The phosphoric acid and potash being in marked excess, the question naturally arises in case of failure could it have been due to the lack of nitrogen. While the Prentiss Fertilizer did not carry nitrate nitrogen, it had about a third of its nitrogen in the water soluble form. Applied on wet land in such a season as 1907, it is possible that some of this may have leached out and there would have been a deficiency for this reason. The same loss from leaching, if it occurred, would have taken place had nitrate of soda been used.

While nitrogen in any available form can be used by plants, it is generally agreed by plant physiologists that plants only take it up after the nitrogen has been changed into nitrate nitrogen. In the case of ammonia salts and organic nitrogen, the change to nitrate nitrogen goes on in the soil due to the action of bacteria. This change takes place only slowly in cold and wet soil and does not proceed at all rapidly until the soil becomes warm. Hence in the first early days of spring, organic nitrogen applied in a fertilizer may be practically unavailable to a plant. For this reason the Station has always recommended that a potato fertilizer carry about a third of its nitrogen in the form of nitrate nitrogen. The potato seems to demand nitrogen in the early part of its growth and while organic nitrogen becomes available later, it might happen that in the early part of the season, a crop manured with only organic nitrogen or nitrogen in the form of ammonia salts, would make a poor growth during the first weeks. It is, of course, possible that loss, so far as the loss can be attributed directly to the fertilizer, was due to the lack of nitrate nitrogen in the fertilizer. There was apparently no fraud, or attempt at fraud, on the part of the manufacturers in omitting nitrate nitrogen because the nitrogen which they furnished in the form of ammonium sulphate was according to market prices in 1907 but little cheaper than the nitrogen in the form of nitrate and equally permissable under the State law.

One of the Station chemists spent a week beginning November 11, visiting farmers in the vicinity of Easton and Presque Isle and talked with them regarding the potato crop, particularly in connection with the R. T. Prentiss Company's fertilizer. Some men were seen who used Prentiss fertilizer only and others who used Prentiss goods and other brands of high grade fertilizers. There was some diversity of opinion but many of the farmers claimed to have not had as good results with the Prentiss fertilizer as with other fertilizers. Some, on the contrary, were found to be satisfied with their crop.

Without attempting to pose as an exponent of law in the matter, it is the writer's opinion that the redress of the farmers is limited to the deficiency in plant food; that they are entitled to a rebate of about 1-11 of the price paid per ton for the fertilizer; and that they could not maintain a case against the company for loss of crop due to the fertilizer. While the fertilizer was deficient in plant food, it was not disastrously so. While in the opinion of the writer, a good potato fertilizer should carry nitrate nitrogen, there can be no fraud shown relative to the form of nitrogen in these goods. Whatever case the user has must be made on the deficiency of plant food, and the writer would not know where to turn for evidence to prove that this relatively small deficiency in plant food could result in any such failure of crop as some of the growers seem to think to have been the case.

In the sale of fertilizers in 1907, the R. T. Prentiss Company violated the Maine Fertilizer Law in three particulars. The goods were not branded in the same way as their certificate reads. Some of these goods were sold without being branded at all. And all of the samples examined were below in one or more constituents and on the average, the goods were about 9 per cent below their guaranty.

The first violation was clerical in that the brand put upon the barrels was printed after the certificate was filed and did not carry the name Prentiss Aroostook Complete.

It was also explained that in the case in which the goods were sent out unbranded that it was due to the lack of barrels and that the goods were sent out in the original bags in which they were received from the factory.

The shortage in plant food was the serious violation, but as it seemed no good could be served by prosecution, as at the most there could only be a small fine imposed, it was thought best to depend, as in other violations of the fertilizer law, upon publicity to call attention to the shortage and to the promise of the company that these matters would be corrected in 1908.

The R. T. Prentiss Company are obtaining their fertilizer for 1908 from the Buffalo Fertilizer Company who made the goods for 1907. These goods are apparently compounded on practically the same formula as in 1907.

At the expense of the R. T. Prentiss Company a Station chemist has sampled all of the cars that have been received in the county up to February 1, 1908. All of the goods received up to early in January carried more nitrogen and potash than called for by the guaranty. The total phosphoric acid was also in excess; the available phosphoric acid was somewhat below guaranty. The makers claim that with their particular process of manufacture the availability of the phosphoric acid will increase so that by the time the goods are used, they will be up to the guaranty in available phosphoric acid. This point is being investigated by the Station. Ten cars received in February ran under in nitrogen and potash. For the most part these goods as in 1907 carry little or no nitrate nitrogen. The company advertises that it will attach to each lot of goods shipped out the exact analysis as found by the Station and base settlement accordingly. It is recommended by the Station that anyone using the Prentiss goods for potatoes in Maine, either make sure that the goods carry nitrate nitrogen, or else use nitrate of soda at the rate of 100 pounds to the acre in connection with the fertilizer. The R. T. Prentiss Company have arranged to supply nitrate of soda for this purpose if desired by their customers.

FREE ANALYSIS OF FOODS, FEEDS, FERTILIZERS, AND SEEDS.

The Station takes pains to obtain for analysis samples of all brands of fertilizers and feeding stuffs coming under the law. It also draws samples of agricultural seeds and foods in the hands of dealers. The co-operation of dealers and consumers is, however, essential for the full and timely protection of their interests.

Foods. Dealers and consumers are invited to send by prepaid express original and unbroken packages of food materials on sale in Maine of whose purity they are for any reason suspicious. Special directions for sending goods from opened packages will be sent on request. As prompt free analysis will be made of such samples as circumstances will allow.

Feeding Stuffs. The Station will promptly analyze samples of feeding stuffs sold in Maine taken in accordance with directions which will be furnished on application. The results will be promptly reported without charge to interested parties. This applies to dealers and consumers alike.

Commercial Fertilizers. It is difficult to draw accurate samples of commercial fertilizers. On this account it is only in rare instances that the Station undertakes analyses of fertilizers other than the samples collected by its representative. In case there is special reason for an examination, the Station invites correspondence on the subject.

Agricultural Seeds. Samples of agricultural seeds on sale in Maine, taken in accordance with directions which can be obtained on application to the Station, will be examined as promptly as possible and the results reported free of charge.

In all cases samples should be accompanied by a full description of the goods, including the name and address of the dealer and the sender. Small samples other than liquids can be forwarded by mail. Others should be forwarded by express, charges prepaid.

All correspondence relative to the laws regulating the sale of food and drugs, feeding stuffs, fertilizers, seeds and creamery glassware, should be addressed to

Director CHAS. D. WOODS,
Orono, Maine.

BULLETINS 150, 151 AND 152.

Bulletin 150, Finances, Meteorology and Index, was issued in January, 1907. It contained the report of the Treasurer for the fiscal year ending June 30, 1907, the meteorological report for the year ending December 31, 1907, and the index to bulletins issued in 1907. This was sent to the Official Mailing List and to Libraries.

Bulletin 151, Food and Drug Inspection, was issued in February, 1908. It contained articles upon: Selling goods removed from packages; Substitution; The guaranty; Work of the inspector; and Dyes, Chemicals and Preservatives. It also gave the results of analyses of salt fish, clams, oysters, scallops, sausage, honey, molasses and vinegar. It was sent to Maine dealers, to the Official Mailing List and to Libraries.

Bulletin 152, Seed Inspection, was issued in March, 1908. It contained the results of the analyses of samples of seeds sent in by correspondents and those collected by the inspector during 1907. This was sent to the Official Mailing List, to Libraries and to the general Station mailing list.

Copies of these bulletins will be sent to any resident of Maine on application. Requests for bulletins should be addressed to the

Agricultural Experiment Station,
Orono, Maine.

University of Maine.

Maine Agricultural Experiment Station

ORONO.

BULLETIN No. 154. APRIL, 1908.

PARIS GREEN. BORDEAUX MIXTURE.

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